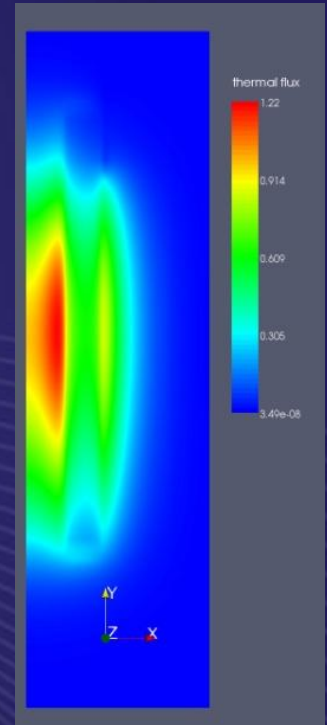
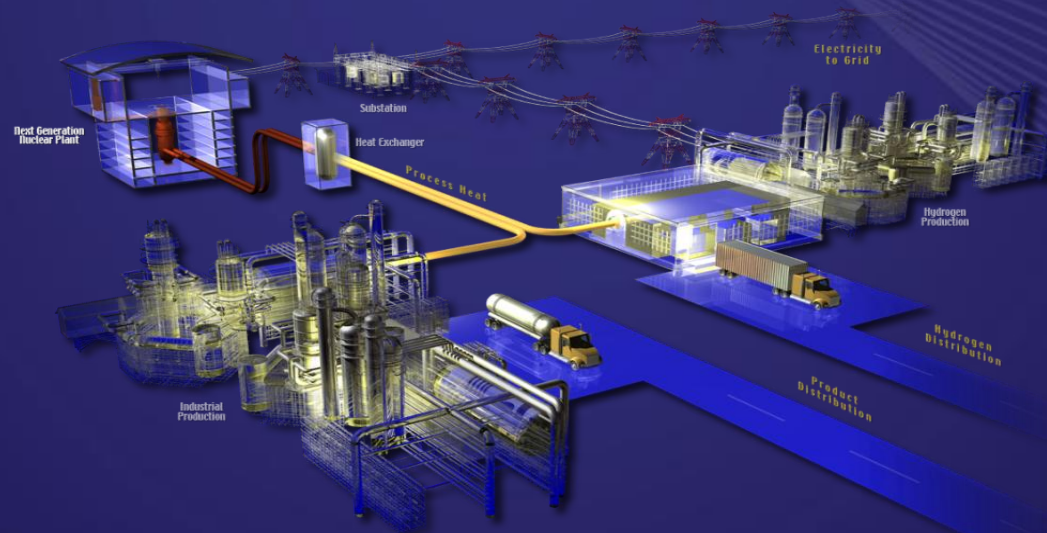


Nuclear Energy University Programs

NGNP Systems Analysis

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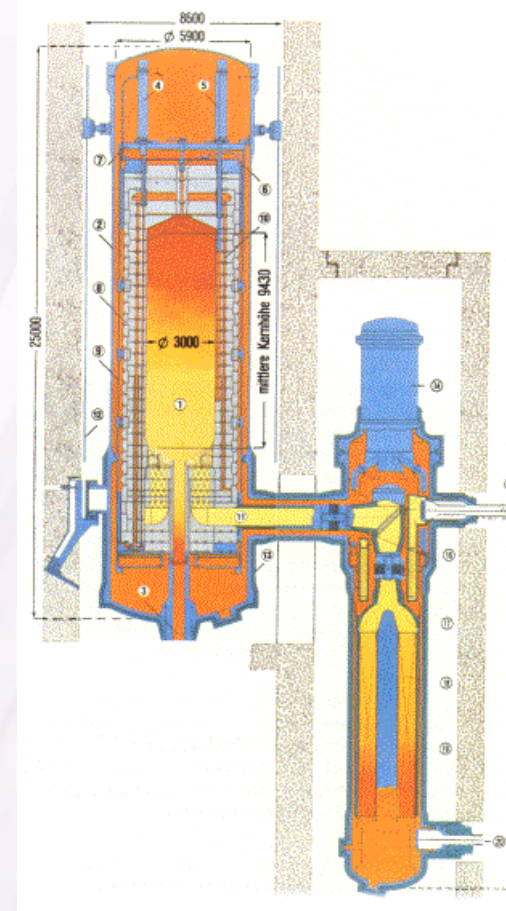


Next Generation Nuclear Plant

- The NGNP Project is part of the Advanced Reactor Concepts development effort
- NGNP specifically seeks to expand the use of nuclear energy beyond electricity generation (high temperature process heat and hydrogen for industrial applications)
- The NGNP R&D Program is engaged in the qualification of high temperature reactor fuel, materials (graphite and alloys), and design and analysis methods
- The VHTR Technology Development Office is the R&D arm of the NGNP Project and is based at the INL. Team members include: ORNL, ANL, and university partners.

High Temperature Gas-Cooled Reactors (HTGR or VHTR)

- ◆ The VHTR is a helium-cooled, graphite moderated reactor with a core outlet temperature between 750 and 850°C with a long-term goal of achieving an outlet temperature of 950°C.
- ◆ The reactor is well suited for the co-generation of process heat and electricity and for the production of hydrogen from water for industrial applications in the chemical and petrochemical sectors.





Workscope

- Technical Workscope in FY12
 - Fuels Qualification
 - Material Qualification (graphite, SiC, high temperature alloys)
 - Design and analysis methods
 - Energy transport, conversion, and application
- Proposals being sought in the areas of
 - Computational Methods and Experimental Validation (NGNP-1)
 - Heat Transport, Energy Conversion, Hydrogen Production, and Nuclear Heat Applications (NGNP-2)
 - *No fuels and materials* proposals are being solicited in FY12 (awaiting further progress on existing projects)



NGNP System Analysis

The development of approaches to coupling gas-cooled reactors with the wide variety of process heat applications (co-generation, coal-to-liquids, chemical feedstocks).

- Hydrogen generation using high temperature steam electrolysis

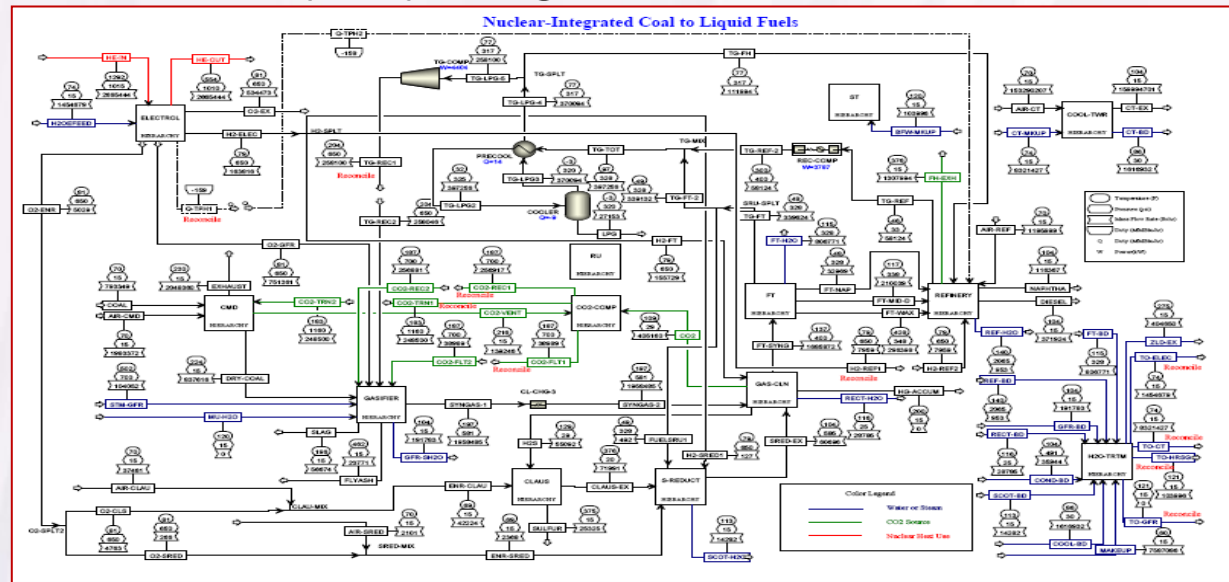


Scope

- Hydrogen generation using high temperature steam electrolysis
- Dynamic simulation of reactor-driven process heat plants focusing upon system feedback, load matching and rejection and the influence of multiple modules
- Economic analysis and optimization of VHTR-process heat plant coupling
- Analysis of alternative coolants

FY12 Solicitation Emphasis

- Advanced in hydrogen generation using high temperature steam electrolysis
- Dynamic simulation and control of multiple module, reactor-driven process heat plants
- Advanced instrumentation and control methods for combined cycle, multiple product systems (load balancing of simultaneous electricity, hydrogen, and process heat production)



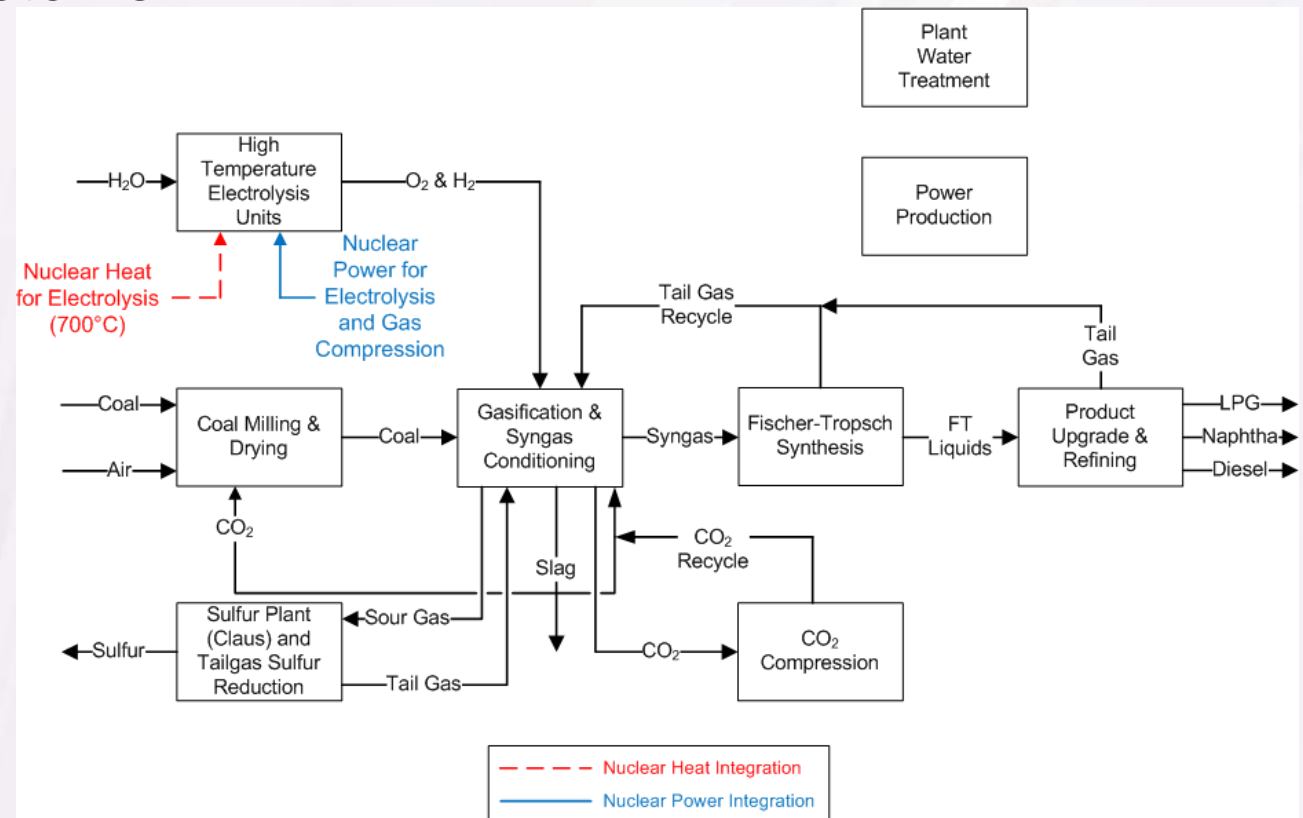


Hydrogen Production using HTSE

- Proposals are sought related to the:
 - development and demonstration of advanced material sets for solid oxide electrolysis cells and stacks that maximize long-term performance
 - modeling and identification of degradation mechanisms with experimental validation
 - development and application of advanced diagnostic techniques for real-time in-situ measurements of cell and stack performance phenomena
 - development and application of advanced diagnostic techniques for post-test examination, with a focus on degradation mechanisms

Nuclear I&C

- Refer to Nuclear Instrumentation & Control Breakout
- Focus on control of multiple modules and multiple power conversion systems





Summary of NGNP Solicitation

- Hydrogen production using high temperature steam-assisted electrolysis
- Instrumentation and control of multiple module/multiple PCS plants

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